Spotlight

SYNLETT

Spotlight 60

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

Pyrrolidine-2-carboxylic Acid (L-Proline)

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Introduction

Pyrrolidine-2-carboxylic acid commonly known as L-Proline (I) has shown, in recent times, excellent catalytic activity, in catalyzing a wide variety of reactions such as aldol,1,2 Mannich,3-5,10-12 Michael,6-9 in a highly enantioselective manner. These reactions have produced a variety of useful chiral materials for organic synthesis.

Most of the L-Proline (I) catalyzed reactions are believed to involve enamine (II) as key intermediate in its catalytic cycle (Scheme 1).

Abstracts

L-Proline (I) catalyzes the asymmetric aldol reaction between acetone and various aldehydes. In the case of hydroxy acetone, it gives anti-diols in excellent diastereo- and enantioselectivities.1,2

L-Proline catalyzes the Michael reaction of ketones with nitro olefins to provide a variety of chiral Michael addition products.6-9

Scheme 1 Proline – catalytic cycle for aldol reaction.
L-Proline catalyzes asymmetric the three component coupling involving Mannich reaction of acetone aldehydes and aryl amines to give β-amino ketones. In case of hydroxyacetone it gives α-hydroxy β-amino ketones in good to excellent ee. This reaction complements the Sharpless asymmetric aminohydroxylation.3–5,10

L-Proline catalyzes Mannich type reaction of protected α-imino ethyl glyoxylate with a variety of ketones to provide functionalized α-amino acids in high enantioselectivities.11,12

L-Proline catalyzes α-amination of ketones by applying azodicarboxylate as nitrogen source to give chiral α-hydrazino, α-amino ketones, and alcohols.13

Recently, I has proved to be the best catalyst for asymmetric Robinson annulation.5

References